



Innovative Protective Helmet for Chem-Bio/Blast Threats



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- CRTI – CBRN Research & Technology Initiative, DND, Canada
- RCMP Explosive Technology Branch
- DRDC Suffield, Canada



Existing CB-Blast System - SRS 5

- Response to urgent requirements (90's)
- Widely deployed in US, Canada, NATO
- Had shortcomings
 - ✦ Users need 2 different sets of PPE
 - ✦ Restricted fit & compatibility with BA
 - ✦ Low fragmentation & blast protection





EOD 9 CB-Blast Protective Helmet

- 1 Multi-purpose helmet system – multiple missions
- Enhanced fit, adjustment, compatibility
- Added functionality, operability
- Higher protection





Helmet customization, adjustability

- 2 Visors for EOD/IEDD & CB-Blast on 1 helmet
- BA Visor compatible with multiple respirators
- Accommodates ISO "O", 99th percentile with gear
- Individually adjustable comfort liner – secure fit



EOD



BA

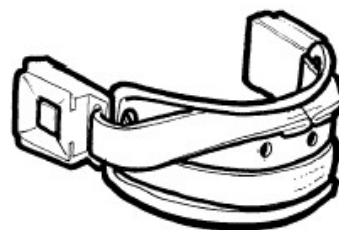
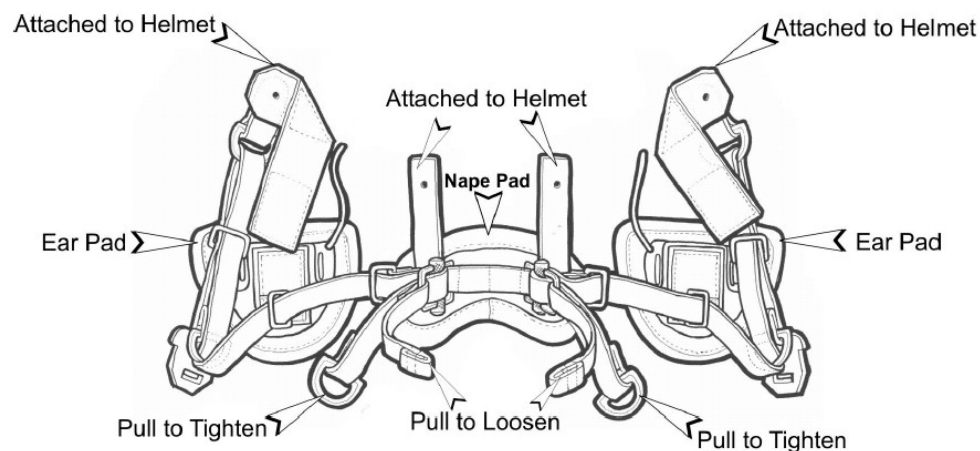


Retention System

- Four-point secure and adjustable retention system

- Provides effective balance of helmet

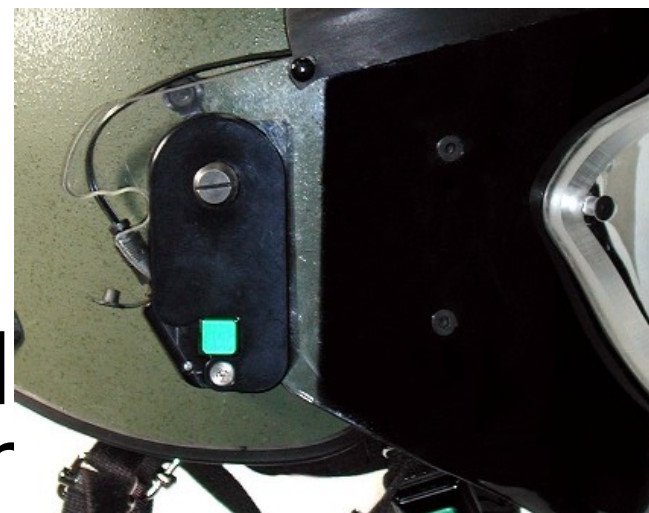
- 2 miniature





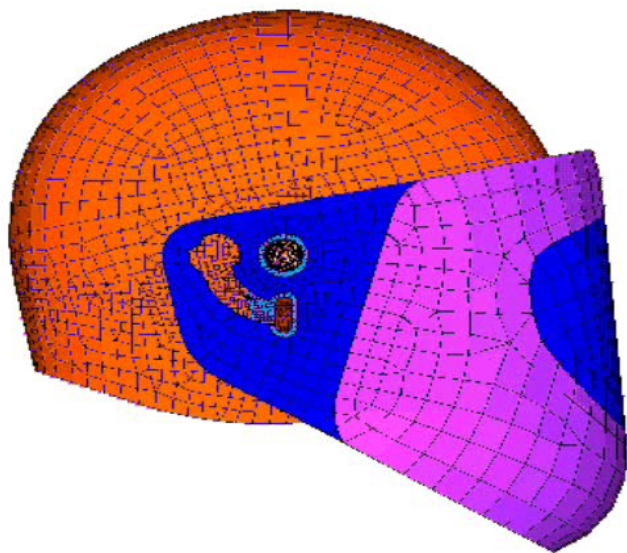
Enhanced Operator Functionality

- Open-faced with lifting visor design
- Secure spring-loaded visor lock mechanism





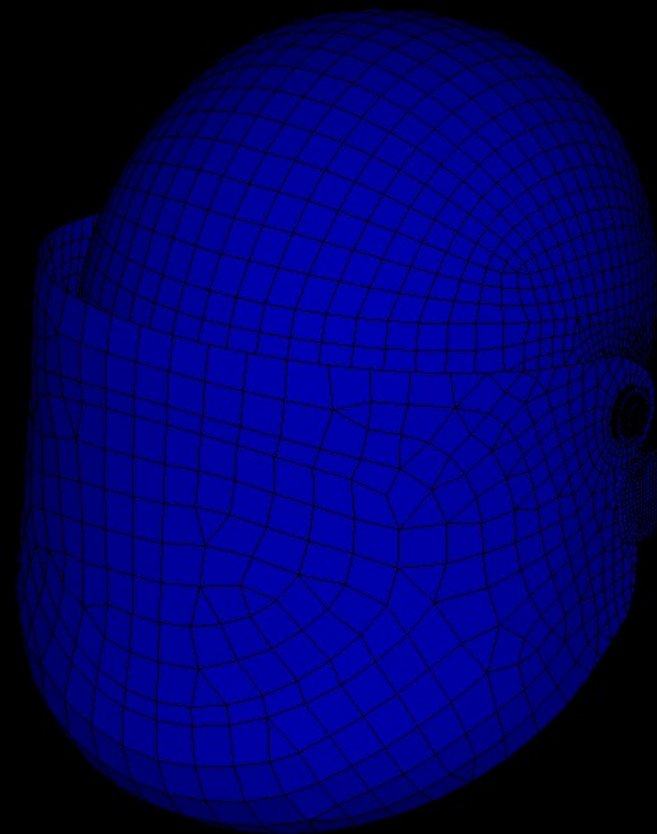
Numerical Blast Simulations



initial position



Max = 5.50e-03
Min = 0.00e+00



Carried out by Martec



Functionality of Helmet - Electronics

- On-board sealed electronics for mission autonomy
- Internalized cabling
- Add-on power supply for extended mission (within suit)





Remote Control Module

- Located on sleeve (R or L)
- Readily visible to operator
- Large buttons for gloved (CB) use
- Controls all helmet functions





External Communication Options

- EAS mics on helmet allows technician to hear ambient noises
- RF or Hard Wire communication link between technician and team (modular)





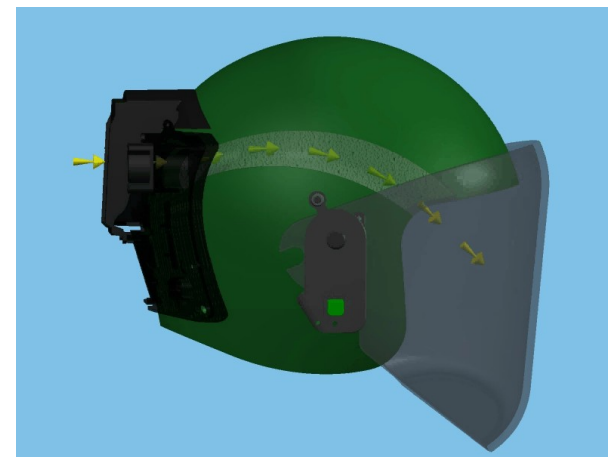
Ventilation System

- Internalized channels
- Regular and turbo modes

EOD 8



EOD 9





Active Demister

- ❖ Prevents formation of condensation
- ❖ Activated by remote control module





Search Lights

- Adjustable, directional, high-intensity LED searchlights
- Integrated to visor
- Low profile
- Activated by



EOD 9



EOD 8



Human Factors in Development

- Extensive user trials (in-house, RCMP, U.S. and NATO users)





Human Factors of Final System

- Enhanced flexibility and field of view





System Tests - MIST-Vapor

- Volunteers submitted to chemical simulants in chamber (RMC)
- Monitoring of chemical-vapor penetration





Human Factors - MIST-Vapor

● Configurations tested

✚ Blower (left)

✚ SCBA (right)





Human Factors - MIST-Vapor

- Physical tasks performed to stretch system seals





Human Factors - MIST-Aerosol

- Similar tests with Biological agent (simulating Anthrax)
- Carried out at DRDC-Suffield





Fragmentation Testing - Shell

MIL-STD-662F 17-grain FSP



● EOD 9 Helmet Shell:
600 m/s (1969 ft/s)



● EOD 8 Helmet Shell:
425 m/s
(1394 ft/s)



● SRS 5 Helmet Shell:
400 m/s



Fragmentation Testing - BA Visor

MIL-STD-662F 17-grain FSP



- EOD 9 BA Visor:
700 m/s (2297 ft/s)



- SRS 5 BA:
250 m/s (820 ft/s)



Full-Scale Blast Testing

- Compare injuries in protected vs. unprotected cases
- Instrumented mannequins dressed in full EOD 9 Ensembles



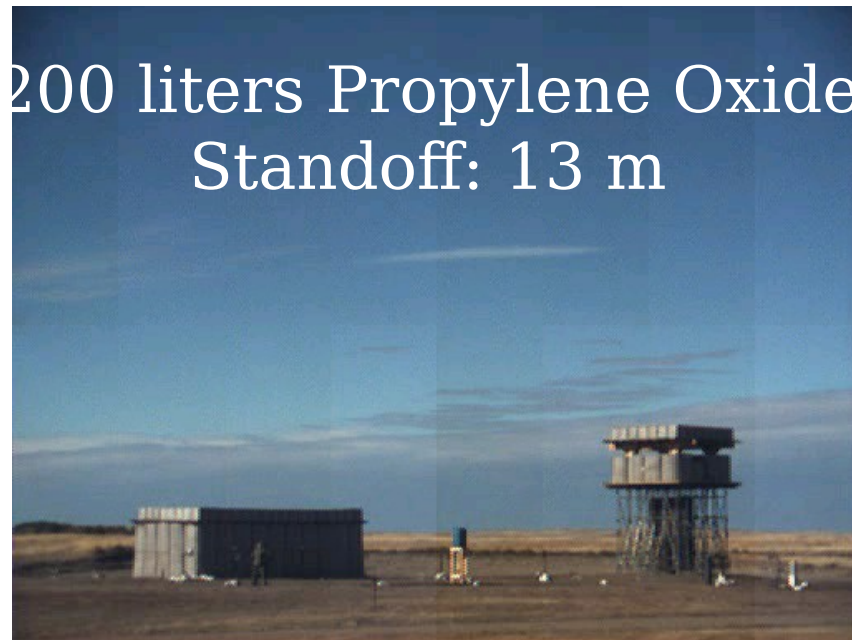


Full-Scale Blast Testing

1.25 lbs C4 @ 2 ft Enhanced Blasts



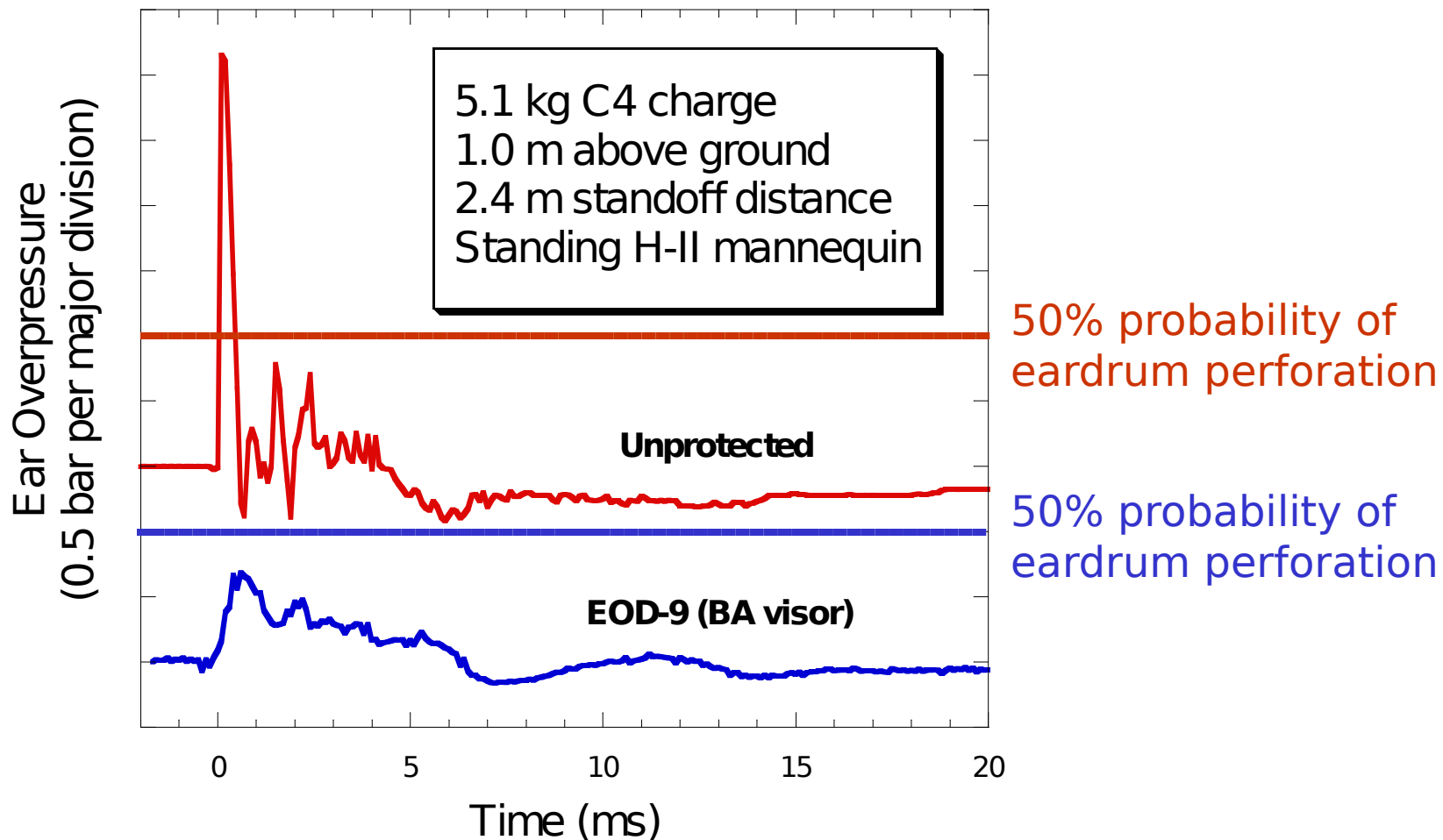
200 liters Propylene Oxide
Standoff: 13 m



DRDC-Suffield, Canada

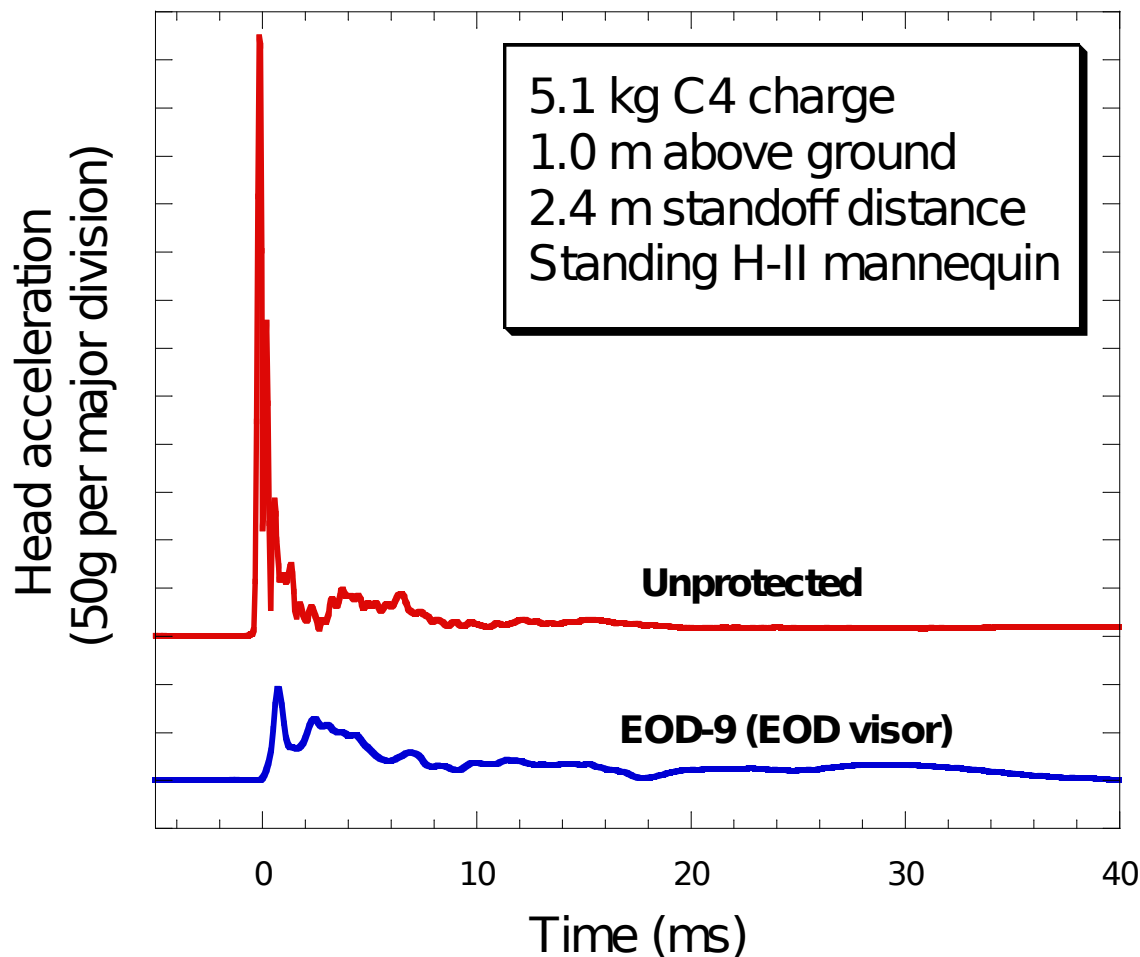


Ear Overpressure Traces





Head Acceleration Traces



66% chance of
critical to lethal
injuries

94% chance of no
concussive injuries



Explosive Dispersal Testing

- Small explosive charge disperses liquid chemical simulants (MeS)
- New test protocol devised in conjunction with DRDC Suffield (2003)





Explosive Dispersal Testing

- ❖ No liquid / vapor simulants found beneath suit or helmet
- ❖ Helmet does not interfere with mask





Impact Protection - Drop Tower

- Testing performed in accordance with ASTM F-1446





Repetitive Action - 18 000 cycles

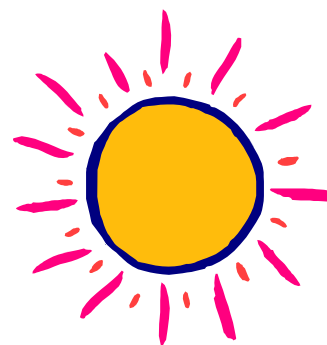




Performance & Reliability Testing

MIL-STD-810F

- ✦ Temperature shock
- ✦ Humidity
- ✦ Vibration
- ✦ Shock (transit drop)





Summary of Helmet Innovations

- ✦ Helmet system design features modularity & integration of elements
- ✦ User centered design for fit, comfort, adjustability & mission compatibility
- ✦ Situational awareness and enhanced functionality
- ✦ Highly protective platform



Multi-Threat Helmet - EOD 9

● EOD 9 Helmet has some similarities with future soldier concepts

- ✦ FFW (US)
- ✦ SIHS (Canada)
- ✦ FELIN (France)
- ✦ FIST (UK)





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